JY997D24901A

MITSUBISHI
PROGRAMMABLE CONTROLLERS
MELSEC-F

Changes for the Better

FX3U-32DP

INSTALLATION MANUAL

Manual Number	JY997D24901
Revision	A
Date	March 2007

Before installation, operation, maintenance or inspection of this product, thoroughly read through and understand this manual and the associated manuals. Also, take care to handle the module properly and safely.
Store this manual in a safe place so that it can be taken out and read whenever necessary. Always forward it to the end user.

Registration
The company name and the product name to be described in this manual are the registered trademarks or trademarks of each company.

Effective March 2007
Specifications are subject to change without notice.

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Safety Precaution (Read these precautions before use.)

This manual classifies the safety precautions into two categories:

⚠DANGER and ⚠CAUTION.

⚠DANGER	Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.
⚠CAUTION	Indicates that incorrect handling may cause hazardous conditions, resulting in medium or slight personal injury or physical damage.

Depending on circumstances, procedures indicated by ⚠CAUTION may also cause severe injury.
It is important to follow all precautions for personal safety.

Associated Manuals

Manual name	Manual No.	Description
FX3U Series User's Manual - Hardware Edition	JY997D16501 MODEL CODE: 09R516	Describes FX3U Series PLC specification details for I/O, wiring, installation, and maintenance.
FX3U/FX3UC Series Programming Manual - Basic & Applied Instruction Edition	JY997D16601 MODEL CODE: 09R517	Describes PLC programming for basic/applied instructions and devices.
FX3U-32DP User's Manual	JY997D25201	Describes details for the FX3U-32DP PROFIBUS-DP Interface Block, i.e. wiring, installation, specification and BFM allocations.
FX3U-64DP-M User's Manual	JY997D19201	Describes details for the FX3U-64DP-M PROFIBUS-DP Master Block, i.e. wiring, installation, specification and BFM allocations.
GX Configurator-DP Configuration System for Open Networks Software Manual	–	Describes the operation of GX Configurator-DP Configuration System for Open Networks Software.

How to obtain manuals
For product manuals or documents, contact with the Mitsubishi Electric dealer you purchased your product.

Certification of UL, cUL standards

The following product has UL and cUL certification.
UL, cUL File Number:E95239
Models: MELSEC FX3U series manufactured
FX3U-32DP

Compliance with EC directive (CE Marking)

This document does not guarantee that a mechanical system including this product will comply with the following standards.
Make sure to have a user/system engineer check the entire mechanical systems comformity to the EMC and LVD directives.
For more details, please contact your local Mitsubishi Electric branch office.

Requirement for the compliance with EMC directive

The following product complies with the European Directive (89/336/EEC) Electromagnetic Compatibility by the direct testings (based on the following standard) and design analysis (by creating a technical construction file) when the following devices's application follows the directions in this document.

Type: Programmable Controller (Open Type Equipment)
Models: MELSEC FX3U series manufactured
from March 1st, 2007 FX3U-32DP

Standard	Tests
EN61131-2:2003 Programmable controllers - Equipment requirements and tests	The corresponding items are tested on the 32DP as follows. • Radiated Emissions • Mains Terminal Voltage Emissions • RF immunity • Fast Transients • ESD • Conducted • Surge • Power magnetic fields

Cautions for compliance with EC Directive

1) Wiring
To avoid malfunctions by noise, lay the twisted-pair PROFIBUS cable so that more than 50 mm (1.97") is touching the grounding plate connected to the ground terminal.
→ For details on wiring, refer to Section 3.2

2) Installing in an enclosure
→ For detail on installing in an enclosure, refer to FX3U User's Manual - Hardware Edition.

1. Introduction

The FX3U-32DP PROFIBUS-DP Interface Block (hereinafter called 32DP) enables users to integrate the MELSEC FX3U PLC into any existing PROFIBUS-DP network (DP-V0/DP-V1) as a DP-Slave. The 32DP links the FX3U PLC with PROFIBUS-DP decentralized control tasks. The module connects the PLC system to the DP-Master in the PROFIBUS-DP network for efficient and easy data exchange.

1) Easy Connectivity to an existing PROFIBUS-DP Network
The 32DP enables the FX3U PLC to fit into an existing PROFIBUS-DP Network as a DP-Slave, while reducing the time and cost for users to build up a new network system.

2) Enhanced Data Exchange
The 32DP has enhanced the data exchange functionality in the following communication formats.
- Cyclic I/O data - a maximum of 144 Bytes
- Acyclic I/O Data - a maximum of 140 Bytes
- User-Diagnostic Messages
- Alarm(Status) Messages

3) Global control
The 32DP supports SYNC / UNSYNC / FREEZE / UNFREEZE global controls.

4) Flexible and Easy Network Setting
The 32DP enables a flexible and smooth integration with components on a new/existing PROFIBUS-DP Network. The FX3U-32DP PROFIBUS Interface Block is fully applicable for the user-specific PROFIBUS-DP Network.
→ For operation details of software, GX Configurator-DP Software Manual

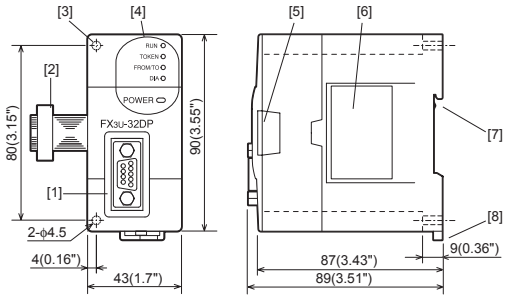
5) Various Communication Speed Options
The 32DP supports the communication speeds, 9.6k, 19.2k, 45.45k, 93.75k, 187.5k, 500k, 1.5M, 3M, 6M and 12Mbps to fit into various kinds of networks. To connect the 32DP to a PROFIBUS-DP Network, use the standard 9-pin D-SUB connector and shielded twisted-pair PROFIBUS cable complying with EN50170.

1.1 Incorporated Items

Product	FX3U-32DP PROFIBUS-DP Interface Block
Included Items	• Manual • Dust Proof Sheet • GSD file (CD-ROM) • Special Unit/Block No. Label

1.2 External Dimensions and Part Names

Dimensions: mm (inches) MASS (Weight): Approx. 0.2kg (0.44 lbs)



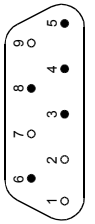
[1] PROFIBUS-DP port (9-pin D-SUB Connector: #4-40unc inch screw thread)
[2] Extension cable
[3] Direct mounting hole:2 holes of ϕ4.5 (0.18") (mounting screw: M4 screw)
[4] Status LED

LED Name	Color	Description
POWER	Green	ON: Correct power supply from the PLC **→ For other status, refer to FX3U-32DP User's Manual**
FROM/TO	Green	ON: Constant FROM/TO access within 200ms intervals
RUN	Green	ON: In cyclic data exchange mode Flashing: DP-Master is in clear mode, or DP-Slave is in Fail/Safe state.
DIA	Red	OFF: Normal Operation without errors Otherwise: An error detected **→ For error details, refer to FX3U-32DP User's Manual**
TOKEN	Green	ON: Estabilished connection with the DP-Master

[5] Extension port under the top cover
[6] Name plate
[7] DIN rail mounting groove (DIN rail: DIN46277)
[8] DIN rail mounting hook

1.3 Pin configuration of PROFIBUS-DP Connector

The connector is a 9-pin D-SUB (#4-40unc inch screw thread) type, with the following pin assignment.



● Assigned
○ Not assigned

Pin No.	Signal Name	Meaning
3	RXD/TXD-P	Receive/Transmit-Data-P
4	RTS	Ready to send
5	DGND	Data Ground
6	VP	Voltage-Plus (5V, 90mA)
8	RXD/TXD-N	Receive/transmit-Data-N
1, 2, 7, 9	NC	Pin not assigned

2. Installation

INSTALLATION PRECAUTIONS ⚠DANGER

- Cut off all phases of the power supply externally before installation or wiring work in order to avoid damage to the product or electric shock.

INSTALLATION PRECAUTIONS ⚠CAUTION

- Use the product within the generic environment specifications described in the PLC main unit manual (Hardware Edition).
  Never use the product in areas with excessive dust, oily smoke, conductive dusts, corrosive gas (salt air, Cl_2, H_2S, SO_2 or NO_2), flammable gas, vibration or impacts, or exposed to high temperature, condensation, or rain and wind.
  If the product is used in such conditions, electric shock, fire, malfunctions, deterioration or damage may occur.
- Install the product securely using the DIN rail or screws.
- Install the product on a flat surface.
  If the mounting surface is rough, undue force will be applied to the PC board, thereby causing nonconformity.
- When drilling screw holes or wiring, make sure cutting or wiring debris does not enter the ventilation slits.
  Failure to do so may cause fire, equipment failures or malfunctions.
- Be sure to remove the dust proof sheet from the PLC's ventilation port when installation work is completed.
  Failure to do so may cause fire, equipment failures or malfunctions.
- Connect the extension cables and communication cables securely to the designated connectors.
  Contact failures may cause malfunctions.
- Do not touch the conductive parts of the product directly to avoid failure or malfunctions.

2.1 Installation Arrangements

The 32DP is connected to the extension port of an FX3U series PLC or extension unit/block (including special function unit/block) on the right side.
Since additional extension devices can be added on both the left and right-hand sides of the PLC, keep an appropriate amount of space on both sides of the PLC when planning to add extension devices in the future.
For further details on installation arrangements, refer to the following manual.
→ FX3U Series User's Manual - Hardware Edition

2.2 Mounting

The 32DP can be mounted on a DIN rail (DIN46227) or mounted directly to the mounting surface with screws.
→ FX3U-32DP User's Manual
→ FX3U Series User's Manual - Hardware Edition

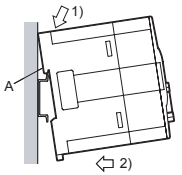
2.2.1 Direct Mounting

The 32DP can be directly mounted with M4 screws.
An interval space of 1 to 2 mm (0.04" to 0.08") between each unit is necessary.
→ For details on the mounting hole pitch, refer to Section 1.2

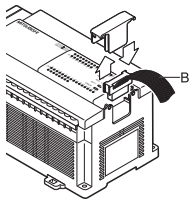
2.2.2 DIN Rail Mounting

The 32DP can be mounted on a DIN rail (DIN46227, 35mm width).

1) Fit the upper edge of the DIN rail mounting groove (right fig. A) onto the DIN rail.
2) Push the product onto the DIN rail.



3) Connect the 32DP's extension cable to the extension port of the main unit, I/O extension unit/block, or special function unit/block.
→ FX3U Series User's Manual - Hardware Edition



3. Wiring

DESIGN PRECAUTIONS ⚠CAUTION

- Make sure to observe the following precautions in order to prevent any damage to the machinery or accidents due to abnormal data written to the PLC under the influence of noise:
  1) Do not bundle the main circuit line together with or lay it close to the main circuit, high-voltage line, or load line.
     Otherwise, noise disturbance and/or surge induction are likely to take place. As a guideline, lay the control line at least 100mm (3.94") or more away from the main circuit, high-voltage line, or load line.
  2) Ground the shield wire or shield of the shielded cable at one point on the PLC. However, do not ground them at the same point as the high-voltage lines.
- Install module so that excessive force will not be applied to the peripheral device connectors. Failure to do so may result in wire damage/breakage or PLC failure.

WIRING PRECAUTIONS ⚠DANGER

- Cut off all phases of the power supply externally before installation or wiring work in order to avoid damage to the product or electric shock.

WIRING PRECAUTIONS ⚠CAUTION

- When drilling screw holes or wiring, make sure cutting or wire debris does not enter the ventilation slits.
  Failure to do so may cause fire, equipment failures or malfunctions.

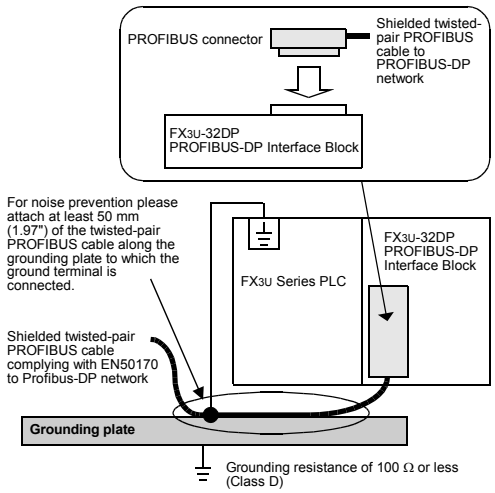
3.1 Applicable Cable and Connector

The following table shows the applicable cable and connector for a PROFIBUS-DP network.

Item	Description
PROFIBUS-DP network cable	Shielded twisted-pair PROFIBUS cable complying with EN50170
Connector	Applicable only to PROFIBUS connector (9-pin D-SUB Connector: #4-40unc inch screw thread) → **For PROFIBUS connectors see the PROFIBUS connector manual**

3.2 Wiring

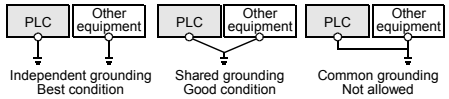
To connect the 32DP to a PROFIBUS-DP network, use the PROFIBUS connector and shielded twisted-pair PROFIBUS cable complying with EN50170.


PROFIBUS connector
Shielded twisted-pair PROFIBUS cable to PROFIBUS-DP network
FX3U-32DP PROFIBUS-DP Interface Block
For noise prevention please attach at least 50 mm (1,97") of the twisted-pair PROFIBUS cable along the grounding plate to which the ground terminal is connected.
FX3U Series PLC
FX3U-32DP PROFIBUS-DP Interface Block
Shielded twisted-pair PROFIBUS cable complying with EN50170 to Profibus-DP network
Grounding plate
Grounding resistance of 100 Ω or less (Class D)

3.3 Grounding

Ground the cable as stated below.

- Use a grounding resistor of 100Ω or less.
- Ground the cables indepently for best results.
  When independent grounding is not used, use "shared grounding" as follows.
  → **For details, refer to the FX3U Series User's Manual - Hardware Edition.**



- The grounding wire size should be AWG 14 (2 mm^2) or larger.
- The grounding point should be as close to the PLC as possible, and all grounding wire should be as short as possible.

3.4 Bus Terminator

To avoid the signal reflections, connect a self-terminating DP-Connector/Device at each end of the PROFIBUS-DP Network.

Note

The FX3U-32DP is not sef-terminated.

4. Specifications

DESIGN PRECAUTIONS ⚠DANGER

- Make sure to have the following safety circuits outside of the PLC to ensure safe system operation even during external power supply problems, communication errors or PLC failure. Otherwise, malfunctions may cause serious accidents.
  1) Most importantly, have the following: an emergency stop circuit, a protection circuit, an interlock circuit for opposite movements (such as normal vs. reverse rotation), and an interlock circuit (to prevent damage to the equipment at the upper and lower positioning limits).
  2) Note that when the PLC CPU detects an error, such as a watchdog timer error, during self-diagnosis, all outputs are turned off. Also, when an error that cannot be detected by the PLC CPU occurs in an input/output control block, output control may be disabled. External circuits and mechanisms should be designed to ensure safe machinery operation in such a case.
  3) Note that when an error occurs in a relay, triac or transistor output device, the output could be held either on or off. For output signals that may lead to serious accidents, external circuits and mechanisms should be designed to ensure safe machinery operation in such a case

DESIGN PRECAUTIONS ⚠CAUTION

- Make sure to observe the following precautions in order to prevent any damage to the machinery or accidents due to abnormal data written to the PLC under the influence of noise:
  1) Do not bundle the main circuit line together with or lay it close to the main circuit, high-voltage line, or load line.
     Otherwise, noise disturbance and/or surge induction are likely to take place. As a guideline, lay the control line at least 100mm (3.94") or more away from the main circuit, high-voltage line, or load line.
  2) Ground the shield wire or shield of the shielded cable at one point on the PLC. However, do not ground them at the same point as the high-voltage lines.
- Install module so that excessive force will not be applied to the connectors. Failure to do so may result in wire damage/breakage or PLC failure.

STARTUP AND MAINTENANCE PRECAUTIONS ⚠DANGER

- Do not touch any terminal while the PLC's power is on.
  Doing so may cause electric shock or malfunctions.
- Before cleaning or retightening terminals, externally cut off all phases of the power supply.
  Failure to do so may cause electric shock.
- Before modifying or disrupting the program in operation or running the PLC, carefully read through this manual and the associated manuals and ensure the safety of the operation.
  An operation error may damage the machinery or cause accidents.

STARTUP AND MAINTENANCE PRECAUTIONS ⚠CAUTION

- Do not disassemble or modify the PLC.
  Doing so may cause fire, equipment failures, or malfunctions.
  For repair, contact your local Mitsubishi Electric distributor.
- Do not drop the product or expose the product to strong impacts, as doing so may cause product damage.
- Turn off the power to the PLC before connecting or disconnecting any extension cable.Failure to do so may cause equipment failures or malfunctions.

DISPOSAL PRECAUTIONS ⚠CAUTION

- Please contact a certified electronic waste disposal company for the environmentally safe recycling and disposal process for your device.

TRANSPORT AND STORAGE PRECAUTIONS ⚠CAUTION

- The 32DP is a precision instrument. During transportation, avoid any impact. Verify the operations of the 32DP after transportation.

4.1 Applicable PLC

Model name	Applicability
FX3U Series PLC	Ver. 2.21 or later

4.2 General Specifications

For the general specification, refer to the PLC main unit manual.
The FX3U PLC's general specifications except the following items are applicable to the 32DP specifications. However, do not perform any dielectric withstand voltage tests or insulation resistance tests on this product.
→ **Refer to FX3U Series User's Manual - Hardware Edition**

Item	Specifications	
Withstand voltage	500V AC for 1 min	Conformance to JEM-1021 between communication connector frame and ground terminal of PLC main unit
Insulation resistance	5 MΩ or more by 500V DC Insulation tester	

4.3 Power Supply Specifications

Item	Description
Internal Power Supply	145 mA at 24V DC is supplied from the internal service power in the main unit via extension cable

4.4 Performance Specifications

Item		Specifications	
Transmission Type		Bus network	
Unit Type		PROFIBUS-DP Slave	
Transmission Data (Maximum Exchanged Data Length)		• Cyclic Data : 144 Byte • Acyclic Data : 140 Byte	
Maximum Number of FX3U-32DP at one PLC		8 units	
Supported Transmission speed (bps) and Bus Length	**9.6k, 19.2k, 45.45k, 93.75k**	1,200 m (3,937') / segment	See Section 4.5
	187.5k	1,000 m (3,281') / segment	
	500k	400 m (1,312') / segment	
	1.5 M	200 m (656') / segment	
	3M, 6M, 12M	100 m (328') / segment	
PROFIBUS Module ID		"F332" hex	
Connector	**PROFIBUS-DP Network**	PROFIBUS-DP network (9 pin D-SUB)	
Global Control		Supports SYNC, UNSYNC, FREEZE, and UNFREEZE modes	
Terminal Resistor		Not built in.	

4.5 Maximum Bus Length and Baud Rate

The following table shows the acceptable bus length.
Maximum Bus Length = (No. of repeaters + 1) * (Bus Length / segment)

Baud Rate (bps)	Maximum Bus Length			
	No repeater	1 repeater	2 repeaters	3 repeaters
9.6k, 19.2k, 45.45k, 93.75k	1,200 m (3,937')	2,400 m (7,874')	3,600 m (11,811')	4,800 m (15,748')
187.5k	1,000 m (3,281')	2,000 m (6,562')	3,000 (9,843')	4,000 m (13,123')
500k	400 m (1,312')	800 m (2,625')	1,200 m (3,937')	1,600 m (5,249')
1.5 M	200 m (656')	400 m (1,312')	600 m (1,969')	800 m (2,625')
3M, 6M, 12M	100 m (328')	200 m (656')	300 m (984')	400 m (1,312')

This manual confers no industrial property rights or any rights of any other kind, nor does it confer any patent licenses. Mitsubishi Electric Corporation cannot be held responsible for any problems involving industrial property rights which may occur as a result of using the contents noted in this manual.

Warranty
Mitsubishi will not be held liable for damage caused by factors found not to be the cause of Mitsubishi; opportunity loss or lost profits caused by faults in the Mitsubishi products; damage, secondary damage, accident compensation caused by special factors unpredictable by Mitsubishi; damages to products other than Mitsubishi products; and to other duties.

⚠ For safe use

- This product has been manufactured as a general-purpose part for general industries, and has not been designed or manufactured to be incorporated in a device or system used in purposes related to human life.
- Before using the product for special purposes such as nuclear power, electric power, aerospace, medicine or passenger movement vehicles, consult with Mitsubishi Electric.
- This product has been manufactured under strict quality control. However when installing the product where major accidents or losses could occur if the product fails, install appropriate backup or failsafe functions in the system.

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